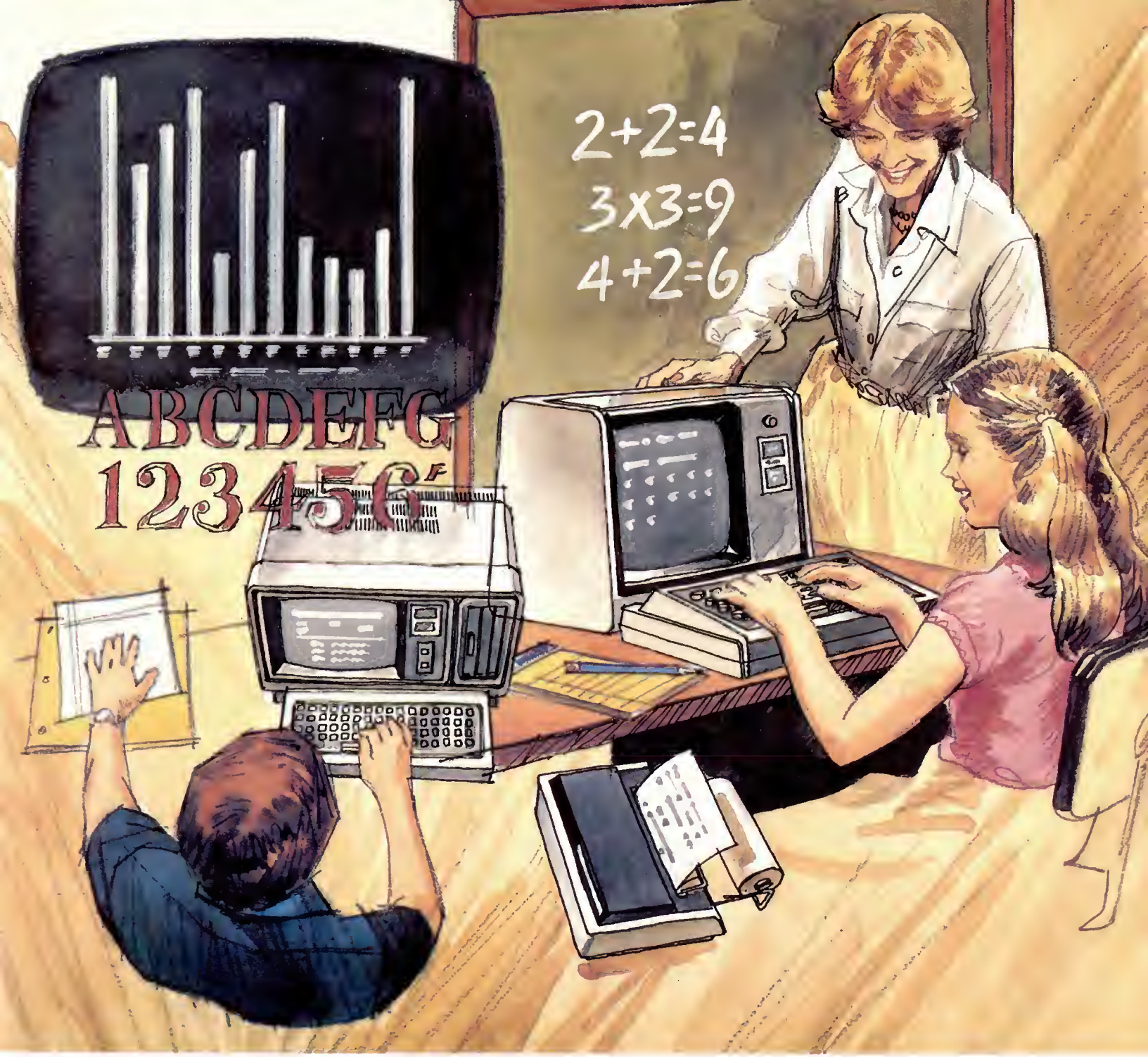

Radio Shack®
TRS-80
Computer Assisted Instruction
™

A Computer Assisted Instruction Program Designed by Professional Educators for Reinforcement and Learning in the Classroom

Important Note to Model III Users

From time to time, Radio Shack may release new versions of TRSDOS, the TRS-80 disk operating system. Check with your local Radio Shack or the *TRS-80 Microcomputer News* for notices and instructions on these enhanced versions of TRSDOS.

If you receive a new version of TRSDOS, read the following before making any modifications to your existing software packages (applications, languages, or system utilities):

- Do not convert your Radio Shack software packages for use with the new version of TRSDOS unless you are instructed to do so.
- Before converting a Radio Shack supplied Model I software package to a Model III format, check to see if Radio Shack provides a Model III version of the package. If so, you should obtain a copy of that version.
- If you're using several different software packages, press the RESET button whenever you change software.

Thank-You!

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8759106

Euclid Geometry Tutor Program

Catalog Number 26-1724

The Euclid Geometry Tutor program is designed to be used as a supplement to any high school geometry course. Its four operational modes (Automatic, Practice, Quiz, and Test) correspond to four levels of difficulty, helping students develop and sharpen their skills in constructing geometry proofs while allowing them to progress at their own rates.

CUSTOM MANUFACTURED FOR RADIO SHACK A DIVISION OF TANDY CORPORATION

Radio Shack® Euclid Geometry Tutor Program

Radio Shack®
A DIVISION OF TANDY CORPORATION
FORT WORTH, TEXAS 76102

Second Edition

This manual was written by Anne Sherwood.

FOREWORD

Learning to prove theorems in geometry can be one of the more difficult and sometimes frustrating experiences for high school students. Euclid Geometry Tutor has been designed to be used in conjunction with any high school geometry course. With this program, you can individualize instruction by placing your students according to their ability in any one of the four modes available. Depending on the mode chosen, a student can:

- have the program develop the entire proof automatically
- provide the statements in a proof with the computer supplying the reasons and conclusions and making hints available
- develop a proof giving both the statements and reasons with hints and conclusions available
- construct a proof giving both statements and reasons with no hints and conclusions available.

Euclid Geometry Tutor was written to meet the needs of both students and teachers. In using the program, your students will have the opportunity to practice the deductive thought processes necessary in geometry and thus sharpen their skills in logical thinking. As a teacher, I believe that you will be gratified to see the progress your students can make by using this program.

Thomas J. Kelanic
Author, Euclid Geometry Tutor program
Geometry Teacher, Taylor Allderdice High School
Pittsburgh, Pennsylvania

Table of Contents

INTRODUCTION

Euclid Geometry Tutor is a computer assisted instruction program that can help students develop and sharpen their skills in constructing geometry proofs. The program's four modes of operation correspond to four levels of challenge available to the student for writing a proof. The program will completely work out a proof (in Automatic mode), guide the student's efforts to construct a proof (in Practice and Quiz modes), or monitor and check the student's proof (in Test mode).

Euclid Geometry Tutor has two main sections:

- User's Guide
- Selected Exercises.

The User's Guide is divided into two parts. Part I is a step-by-step demonstration of how to operate the program using a sample proof. Part II is a comprehensive reference section on the various features and options of the program. The Selected Exercises section provides appropriate material for students to use with the program in the form of diagrams and word problems.

Euclid Geometry Tutor can be used with the following systems:

- TRS-80 Model I (with Level II BASIC) 16K tape system
- TRS-80 Model I (with Level II BASIC) 32K or 48K disk system
- TRS-80 Model III (with Model III BASIC) 16K tape system
- TRS-80 Model III (with Model III BASIC) 32K or 48K disk system
- a Radio Shack Network System, which can support up to 16 student stations with a single central TRS-80 disk system.

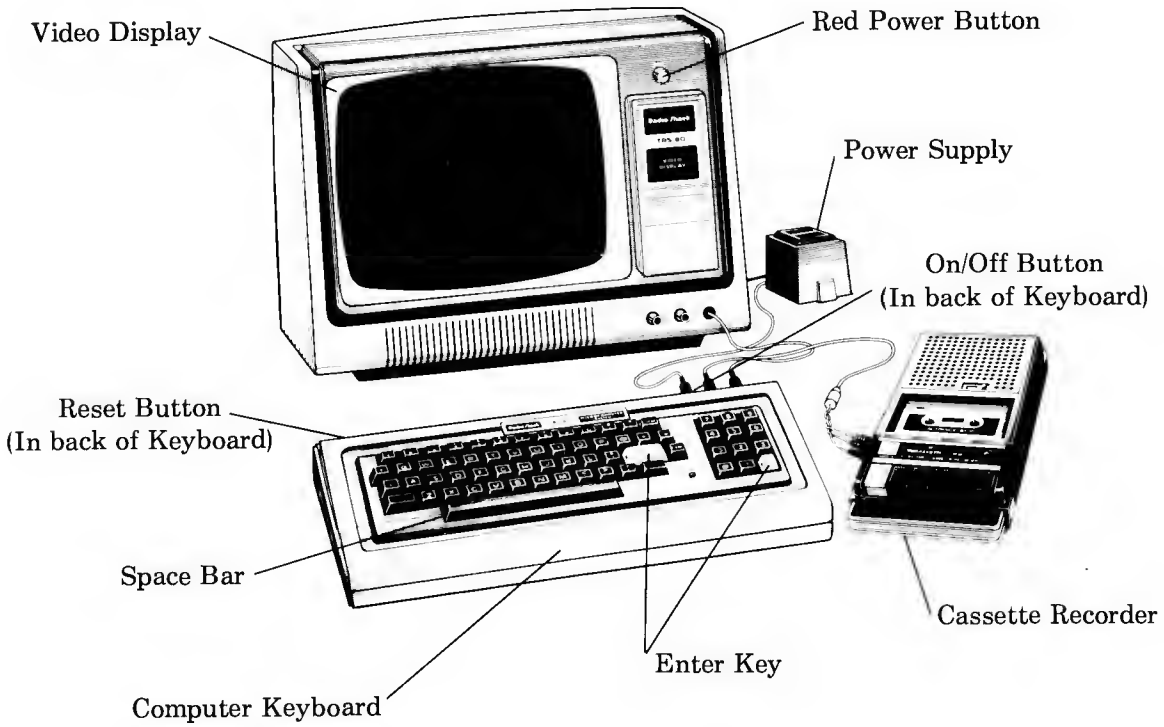
Teachers and students both will find that the Euclid Geometry Tutor program can provide valuable assistance in mastering the skills needed to construct logical and sound geometric proofs.

USER'S GUIDE

PART I

WORKING WITH THE TRS-80 COMPUTER

Before loading the Euclid Geometry Tutor program into the TRS-80, take a moment to familiarize yourself with the computer. Here are the major components you'll need to know:



Note: If you are setting up your TRS-80 for the first time, refer to the user's manual packed with each TRS-80 system for instructions. If you own a TRS-80 Model III, please read APPENDIX II on page 61 before proceeding.

Before you load the program, let's take a moment to review some special keys and features.

SPECIAL KEYS AND FEATURES

READY
>_

When the "READY prompt" appears on the screen, the computer is waiting for a command (e.g., R U N ENTER). (If you are using a TRS-80 Model III, you will see a flashing box instead of the short line.)

This flashing rectangle is called a "cursor." It flashes whenever you need to enter information into the computer (e.g., options selected from option list, the text of a statement or a reason).

ENTER

This key is used to enter information into the computer. Remember to press ENTER:

- after you have typed any kind of information onto the screen
- to terminate the list of "givens."

O ENTER

Whenever the program is waiting for you to type a statement, you can press the letter O and ENTER to obtain the list of command options. (See page 28 for an explanation of the various command options.)

SPACE BAR

If a finished proof is too long to fit on the screen completely, only the first part of the proof will appear on the screen. Press the SPACE BAR and the remaining lines will be displayed on the screen.

The "left-arrow" key can be used to erase characters when typing information onto the screen. Each press of the key moves the cursor back one space and erases the character in that space. To erase the entire line of print, press SHIFT  and the cursor returns to the beginning of the line.

LOADING THE EUCLID GEOMETRY TUTOR PROGRAM

Using the Computer Tape System

To load the Euclid Geometry Tutor program into the computer, follow these steps in exact order.

TRS-80 Model I and Model III

1. a. If you are using a Model I computer, turn on the video display by pressing the power button. Next, turn on the keyboard by pushing in the power button on the back.

   b. If you are using a Model III computer, turn on the computer. (The On/Off switch is under the right side of the keyboard.)

2. Place the program cassette in the cassette recorder.

3. Set the volume level of the cassette recorder between 5 and 7.

4. Press "REWIND." When the cassette is rewound, press "STOP," then press "PLAY."

5. If you are using a Model III: When **Cass?** appears on the video display, press [L].

6. When **Memory Size?** appears on the video display, press [ENTER].

7. Type [C][L][O][A][D], then press [ENTER]. (If the program is loading properly, two asterisks will appear in the upper right corner of the screen. The right asterisk will blink.)*

8. When the **READY** prompt appears on the screen, press the "STOP" button, then press "REWIND" to rewind the tape on the recorder. Next, remove the tape and replace it in the cassette holder to protect it from damage.

9. Type [R][U][N] and press [ENTER]. You'll see the title screen appear on the video display.

To begin working with Euclid Geometry Tutor, turn to page 9.

*If the asterisks do not appear after several seconds:
- press "STOP"
- turn the volume a little higher
- press the reset button (at the rear of the Model I keyboard, and on the right side of the Model III keyboard)
- repeat the instructions from Step 4.

If the asterisks appear, but the right one does not blink:
- press "STOP"
- turn the volume a little lower
- press the reset button (at the rear of the Model I keyboard, and on the right side of the Model III keyboard)
- repeat the instructions from Step 4.

Using the Computer Disk System

TRS-80 Model I

1. Turn on the disk drives, video display, and expansion interface.

2. Place the program diskette with the square notch up and the label to the right in DRIVE Ø (DRIVE Ø is the disk drive closest to the expansion interface), and close the door.

3. Turn on the keyboard by pushing in the power button located on the back to the left of the power jack.

4. When **DOS READY** appears on the screen type [B][A][S][I][C], then press [ENTER].

5. When **HOW MANY FILES?**_ appears on the screen, press [ENTER]. When **MEMORY SIZE?**_ appears on the screen, press [ENTER] again.

6. Type [R][U][N]["][G][E][O][M][E][T][R][Y]["] and press [ENTER]. You'll see the title screen appear on the video display.

To begin working with Euclid Geometry Tutor, turn to page 9.

TRS-80 Model III

IMPORTANT: Before using the Euclid Geometry Tutor program for the first time, you must follow the **Conversion Procedure** on page 59.

1. Turn on the computer. (The On/Off switch is under the right side of the keyboard.)

2. When the red light goes off, insert the program diskette in DRIVE Ø (the bottom drive) with the square notch to the left and the label facing up, and close the door.

3. Press the orange RESET button.

4. Type the date, being sure to use two digits each for the month, day, and year, with a slash separating each pair. (Example: [Ø][2][/][Ø][1][/][8][1] for February 1, 1981.) Then press [ENTER].

5. Enter the time OR simply press [ENTER]. (If you enter the time, be sure to use two digits each for the hour, minutes, and seconds, with a colon separating each pair.)

6. When **TRSDOS Ready** appears on the screen, type [B][A][S][I][C] [ENTER].

7. When **How Many Files?** appears on the screen, press [ENTER]. When **Memory Size?** appears on the screen, press [ENTER] again.

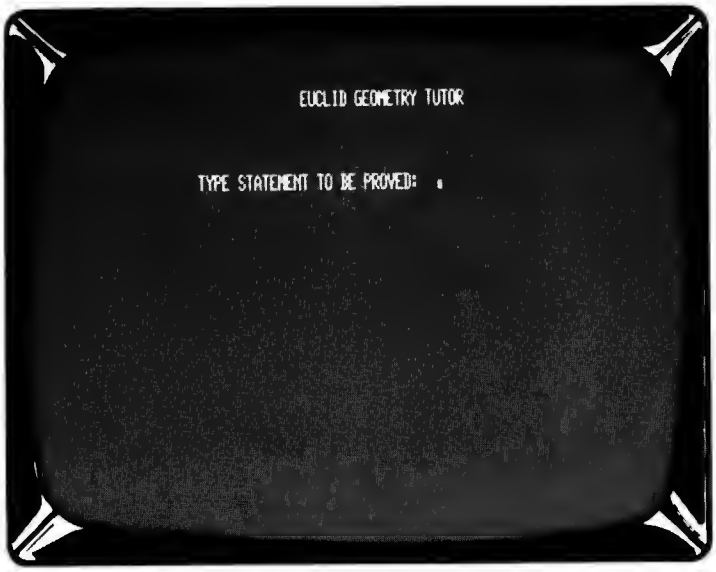
8. When the **READY** prompt appears, type [R][U][N]["][G][E][O][M][E][T][R][Y]["] and press [ENTER]. You'll see the title screen appear on the video display.

To begin working with Euclid Geometry Tutor, turn to page 9.

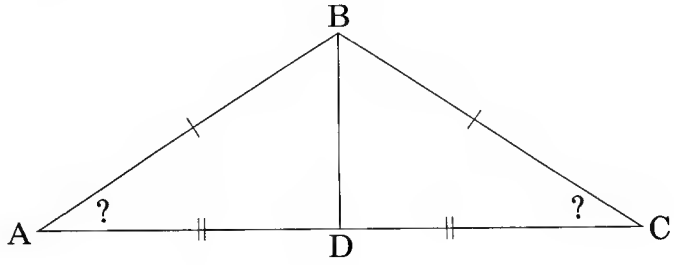
USING THE EUCLID GEOMETRY TUTOR PROGRAM

The first screen you will see when the GEOMETRY program is loaded and running is the title screen:

Next, a second screen appears that asks you to type the statement to be proved:



For demonstration purposes, let's prove that angle BAD is congruent to angle BCD (indicated by question marks in the following diagram). Note: Slashes indicate pairs of congruent line segments.



By studying the diagram, you can see that a good strategy for your proof is to first show that triangles BAD and BCD are congruent using the side-side-side (SSS) postulate, and then to conclude that angles BAD and BCD are congruent because they are corresponding parts of congruent triangles.

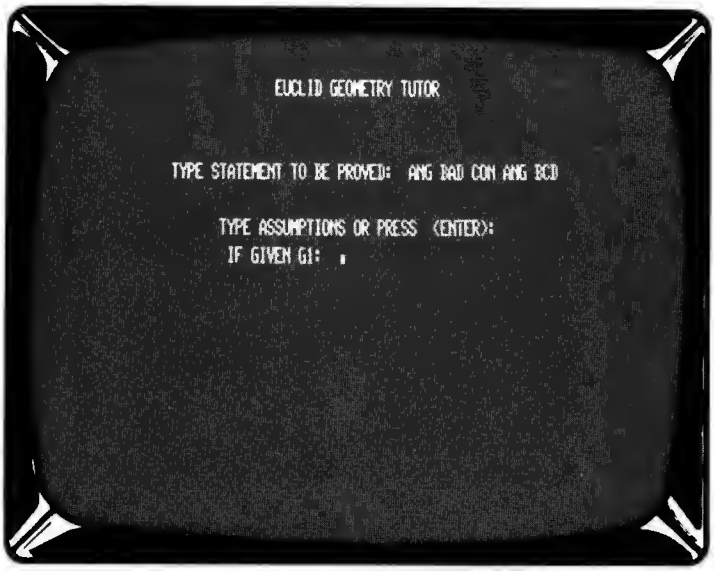
Begin by typing:

ANG BAD CON ANG BCD

This statement tells the program that you want to prove

ANGle BAD is CONgruent to ANGle BCD*

You will be using abbreviated forms for all of your statements to make it easier to communicate with the computer. Before you press [ENTER], check the statement you typed for typographical errors. If necessary, use the left-arrow [←] key to backspace to the error, then retype to the end of the line. When you're sure your statement is correct, press [ENTER] to enter it into the computer. (Pressing [ENTER] tells the computer to evaluate what you have typed.) Next, you'll be asked to either type your assumptions (or givens) or press [ENTER]. (See **ERROR MESSAGES** on page 31 if you have any trouble.)



*See **HOW TO FORMULATE STATEMENTS** (page 23) and **EQUIVALENT STATEMENTS** (page 26) for the correct format for statements used in your proofs.

Looking at the diagram on page 9, notice that certain assumptions have been made upon which the proof will be based. This given information is:

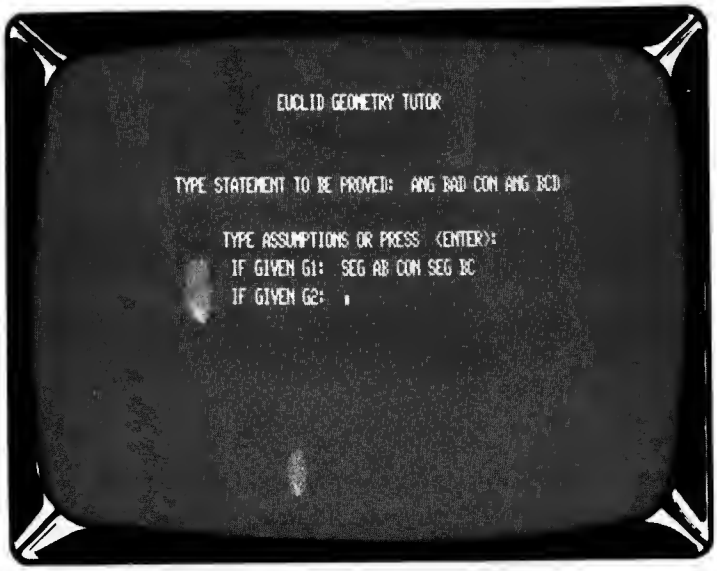
SEGment AB is CONgruent to SEGment BC

SEGment AD is CONgruent to SEGment DC

So, for the first "given" (G1) type:

SEG AB CON SEG BC ENTER

When you do, the screen will show:

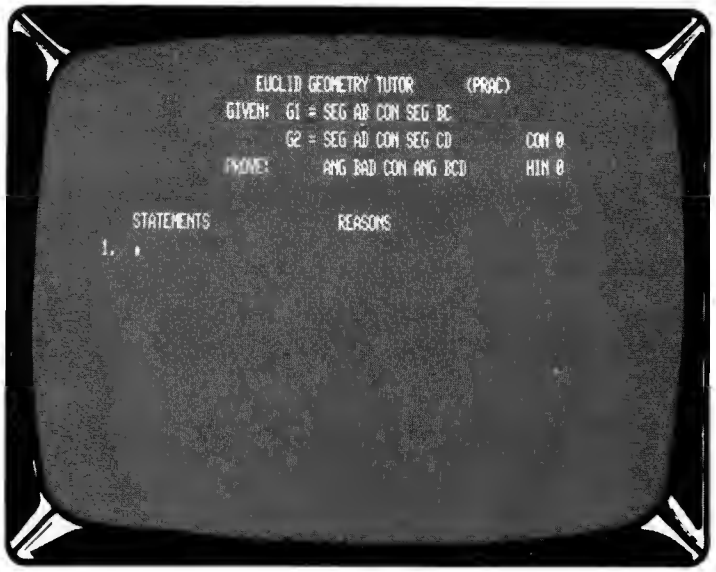


Now type:

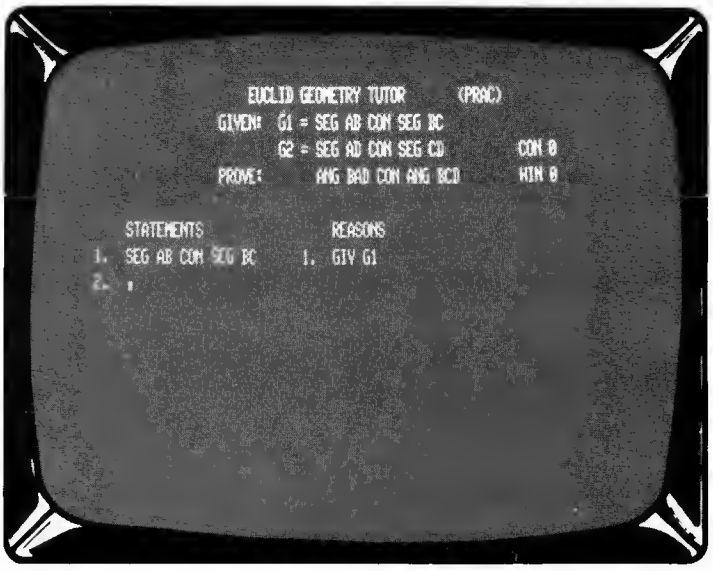
SEG AD CON SEG DC ENTER

for your second given (G2). When the program asks for a third given, press ENTER to indicate you have finished typing in your given statements. This screen appears next:

You can now choose the mode of operation, or the amount of help the program will provide in completing your proof. For now, let's press [2] [ENTER] to use the Practice mode. You'll then see:



When working in the Practice mode, you supply the statements for the proof, while the computer supplies the reasons. For the first statement you'll want to use the first given. Type [G] [1] [ENTER], and the computer prints the first given statement in the STATEMENTS column, together with the reason "GIV G1" in the REASONS column. The screen will show:

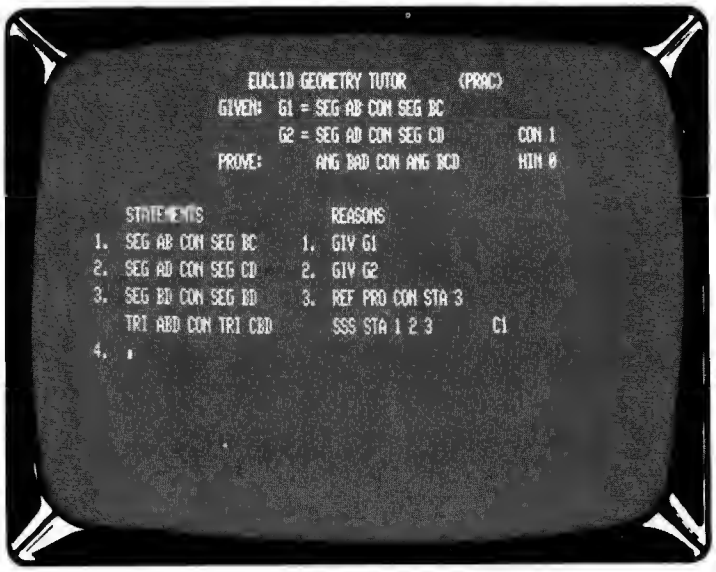


Notice that in the upper right corner of the screen the program keeps track of the conclusions (CON) and hints (HIN) available for your use. (You will learn how this feature can be used a little later.) Right now the program is waiting for the second statement in your proof. To use the second given, type [G] [2] [ENTER]. Again, the program provides the full statement of the second given along with the reason. You will have to wait several seconds for the computer to evaluate your last entry. Once the cursor reappears you can enter your third statement.

In order to follow the side-side-side strategy mentioned earlier, you'll need to state that the remaining sides of the triangles are congruent by typing:

SEG BD CON SEG BD ENTER

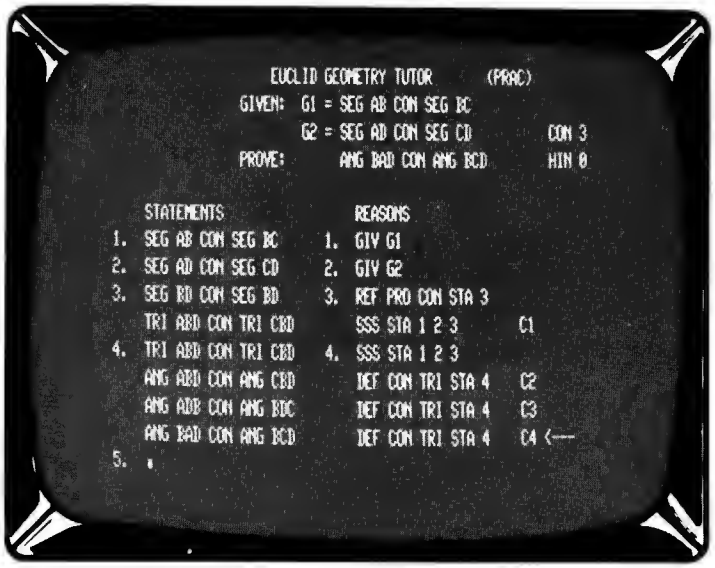
After the program evaluates this statement, the screen shows:



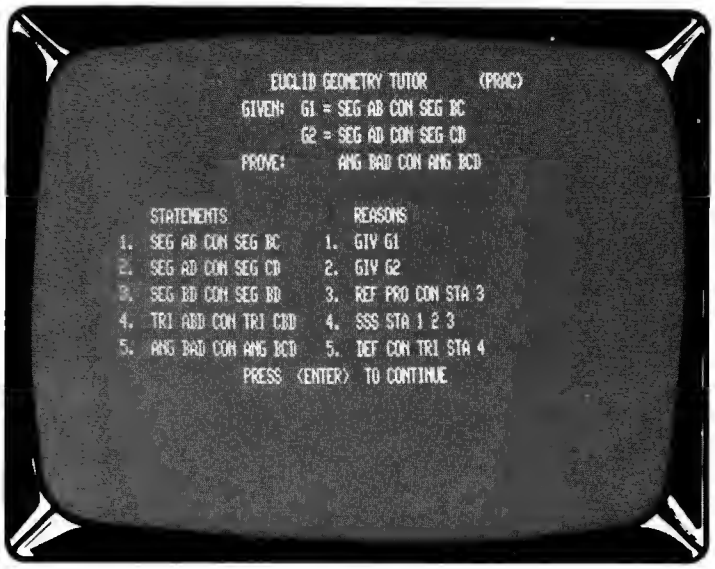
Reason 3, "REF PRO CON STA 3," has been supplied by the program and is a shortened form of

REFlexive PROperty of CONgruence and STAtement 3

The next line tells you that the program has reached the conclusion (C1) that triangle ABD is congruent to triangle CBD because of the Side-Side-Side postulate and statements 1, 2, and 3.* Since this conclusion is part of your strategy, you'll want to use it. Type C 1 ENTER and the program prints the full statement and reason corresponding to C1, then lists three conclusions arising from this statement:

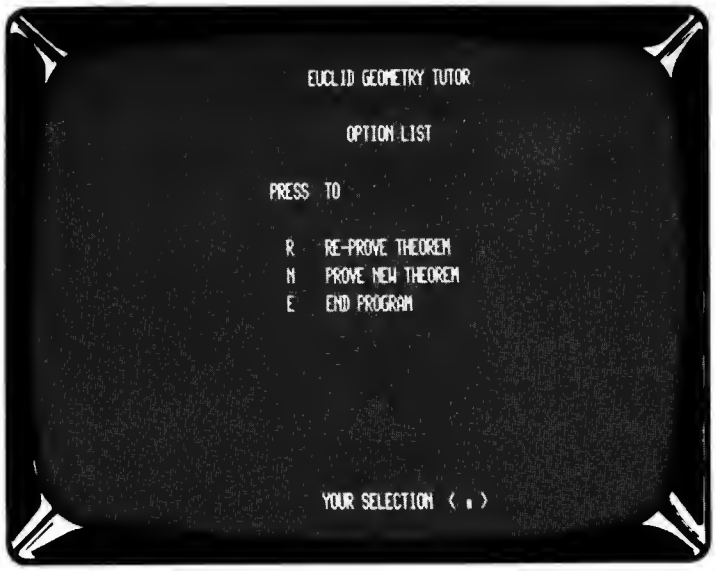


The conclusion labeled C4 is marked with an arrow to indicate that this is the statement you are trying to prove. C4 concludes that angle BAD is congruent to angle BCD because of the definition of congruent triangles and Statement 4 (DEF CON TRI STA 4). Type C 4 ENTER for the final statement in your proof. Once the program has determined that your proof is complete, this screen appears:



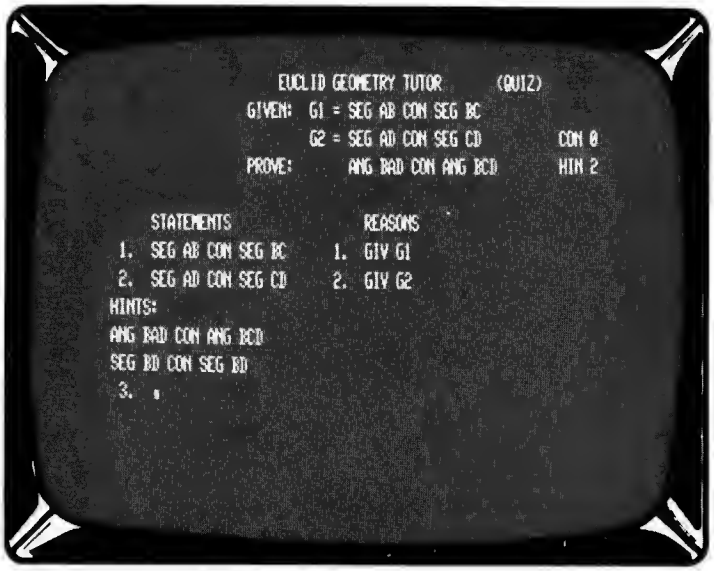
*See **HOW TO FORMULATE REASONS** on page 24 for information on the abbreviated format for reasons.

When you have finished reviewing the proof, press **ENTER** to continue. The screen that follows allows you to select R to re-prove the theorem, N to prove a new theorem, or E to end the program.



Let's press **R** **ENTER** to re-prove the theorem. You'll then be asked to choose a mode for proving your theorem. Press **3** **ENTER** to use the Quiz mode. Begin by using G1 and G2 as the first two statements of the proof. Notice that the computer automatically gives the reasons for these statements. (In the Quiz mode, reasons are provided for the given statements only; you must supply the reasons for all succeeding statements yourself.) When the cursor prompts you for Statement 3, notice that the computer is keeping track of the number of conclusions and hints in the upper right corner of the screen, and shows that two hints have been generated so far:

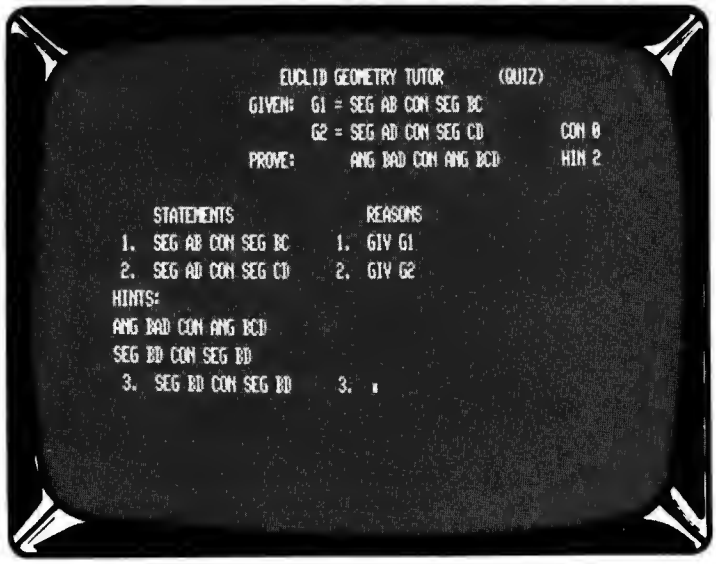
If you'd like to take a look at these hints, type [H] [ENTER] in place of a statement. When you do, the screen will show:



In this program, hints are provided as possible considerations for statements. A hint can be used only if it can be justified with a valid reason at that particular point in the proof. The first hint on the screen (ANG BAD CON ANG BCD) is the hypothesis you are trying to prove; it cannot be justified at this time, however, because you have not yet proved the two triangles congruent. The second hint (SEG BD CON SEG BD) can be used as Statement 3 because it can be justified with a reason. So, type:

SEG BD CON SEG BD [ENTER]

The cursor then moves to the REASONS column to indicate that you need to supply a reason for Statement 3:



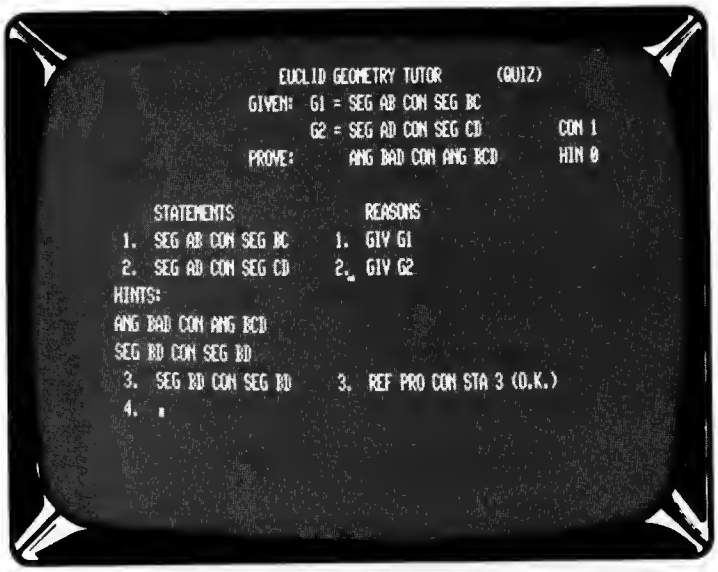
Type:

REF PRO CON STA 3 ENTER

to indicate

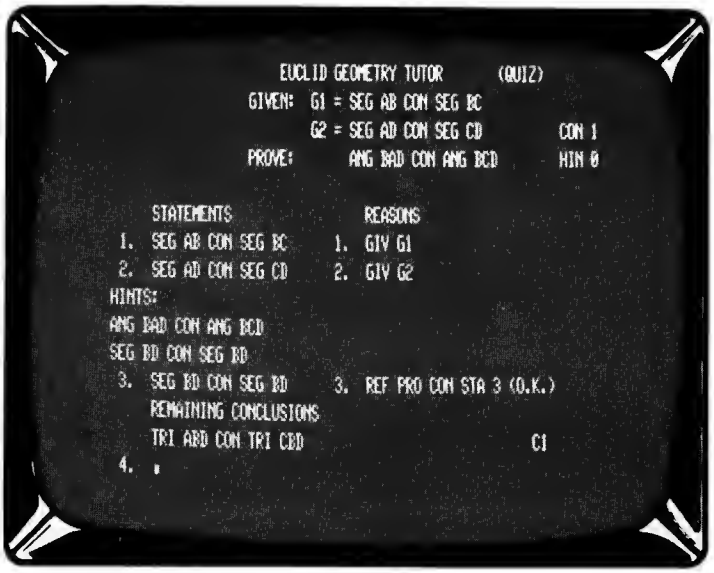
REFlexive PROperty of CONgruence and STAtement 3*

If your reason entry is logically correct and has been properly typed, the program prints (O.K.) next to the reasons. If not, the statement and the correct reason are printed on the next line, followed by (ERR.) to show that you made an error on your reason entry. When the cursor reappears, notice that no hints are available for Statement 4, but now one conclusion has been generated:



*See **HOW TO FORMULATE REASONS** on page 24 for information on constructing acceptable reasons.

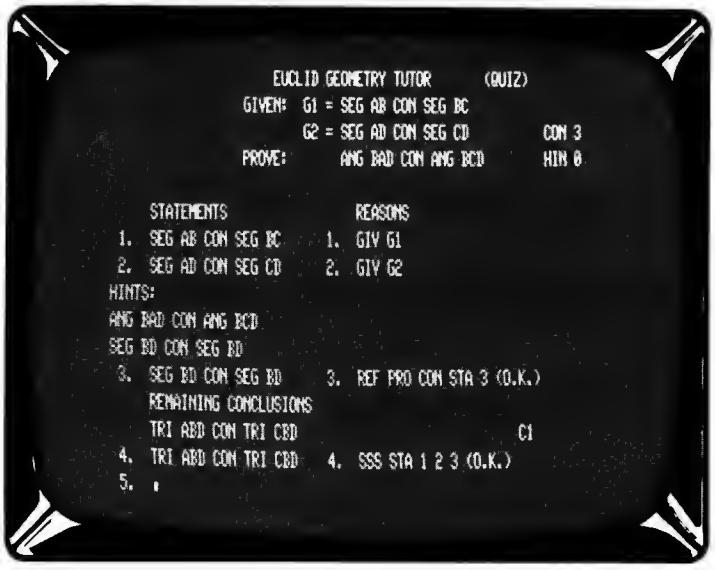
At this point you can either type in Statement 4, or you can look at the conclusion. Let's type [C] to see the conclusion:



You'll want to use this conclusion for your fourth statement, so type [C] [1] [ENTER]. Notice that the [C] option provides conclusions, but not the corresponding reasons. So, type:

SSS STA 1 2 3 [ENTER]

for your reason. (Be sure to leave one space between each of the numerals 1, 2, 3.) You can see that three more conclusions have now been generated:



If you type [C] [ENTER] and review the conclusions, you will notice that Conclusion 4 is the statement you want to prove; so type [C] [4] [ENTER] as Statement 5 and DEF CON TRI STA 4 [ENTER] as Reason 5. Your proof is now complete and the entire proof should appear on the screen for you to review.

Note: The Test mode functions similarly to the Quiz mode, but conclusions and hints are not available. (See **OPERATING MODES** on page 30 for a comparison of the four modes.)

Again, you can press [ENTER] to continue and press [R] to re-prove the theorem, press [N] to prove a new theorem, or press [E] to end the program. (If you choose to end the program, you can run the program again by typing [R] [U] [N] [ENTER].)

If you are ready to stop for now, make sure that you remove the diskette from the disk drive *before* turning off the computer. Tape system users should be sure the tape has been removed and stored in the cassette box.

USER'S GUIDE
PART II

HOW TO FORMULATE STATEMENTS

In Euclid Geometry Tutor there are three *set* keywords and two *relational* keywords that are used in constructing statements. The set keywords identify components of geometric figures:

SEG	(= line segment)
ANG	(= angle)
TRI	(= triangle)

The relational keywords indicate the relationship between two of these components:

CON	(= congruent)
PAR	(= parallel)

These keywords are combined with identifiers (such as AB or XYZ) to construct statements in a form the computer can understand. The format for all statements is:

[set keyword] [identifier] [relational keyword] [set keyword] [identifier]

with a space separating each component.

The following are examples of acceptable statements and their meanings:

SEG AB CON SEG XY	**SEG**ment **AB** is **CON**gruent to **SEG**ment **XY**.
SEG AB PAR SEG XY	**SEG**ment **AB** is **PAR**allel to **SEG**ment **XY**.
ANG ABC CON ANG XYZ	**ANG**le **ABC** is **CON**gruent to **ANG**le **XYZ**.
TRI ABC CON TRI XYZ	**TRI**angle **ABC** is **CON**gruent to **TRI**angle **XYZ**.

Note: The maximum number of given statements that may be entered at the beginning of the program is 10. Proofs may consist of up to 25 statements.

HOW TO FORMULATE REASONS

When using the Euclid Geometry Tutor program in the Quiz and Test modes, you'll need to formulate reasons for your statements, and enter them in an abbreviated format. The following table gives the various reasons that can be used in the program, their meanings, and the abbreviated format.

REASON[1]	MEANING	ABBREVIATED FORMAT
REFlexive PROperty of CONgruence and STAtement *c*	A set[2] is congruent to itself.	REF PRO CON STA *c*
TRAnsitive PROperty of CONgruence and STAtements *x* and *y*	If a first set is congruent to a second set and the second set is congruent to a third set, then the first set is congruent to the third set.	TRA PRO CON STA *x y*
Angle-Angle postulate and STAtements *x* and *y*	If two pairs of corresponding angles of two triangles are congruent, then the third angles of the triangles are congruent.	AA STA *x y*
Side-Side-Side postulate and STAtements *x*, *y*, and *z*	If the corresponding sides of two triangles are congruent, then the triangles are congruent.	SSS STA *x y z*
Side-Angle-Side postulate and STAtements *x*, *y*, and *z*	If two pairs of corresponding sides and one pair of corresponding included angles of two triangles are congruent, then the triangles are congruent.	SAS STA *x y z*

[1]The letter *c* refers to the current statement number; letters *x*, *y*, and *z* refer to previous statement numbers (which must be listed in numerical order).

[2]A set is a line segment or an angle.

REASON[1]	MEANING	ABBREVIATED FORMAT
Angle-Side-Angle postulate and STAtements, *x*, *y*, and *z*	If two pairs of corresponding angles and one pair of corresponding included sides of two triangles are congruent, then the triangles are congruent.	ASA STA *x y z*
DEFinition of CONgruent TRIangles and STAtement *x*	Corresponding parts of congruent triangles are congruent.	DEF CON TRI STA *x*
Parallel Alternate Interior angles postulate and STAtement *x*	If two segments are parallel, then the alternate interior angles are congruent.	PAI STA *x*
TRAnsitive PROperty of PARallelism and STAtements *x* and *y*	If a first segment is parallel to a second segment and the second segment is parallel to a third segment, then the first segment is parallel to the third segment.	TRA PRO PAR STA *x y*
The symmetric properties of congruence and equality	If a first set[2] is congruent to a second set, then the second set is congruent to the first. (In working with this program, the user does not need to be concerned with the symmetric properties. They are mentioned here only because they are used by Euclid Geometry Tutor in its calculations.)	

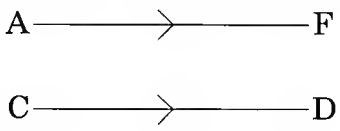
[1]The letter *c* refers to the current statement number; letters *x*, *y*, and *z* refer to previous statement numbers (which must be listed in numerical order).

[2]A set is a line segment or an angle.

EQUIVALENT STATEMENTS

In Euclid Geometry Tutor, two simple "naming" rules must be observed for the program to function properly:

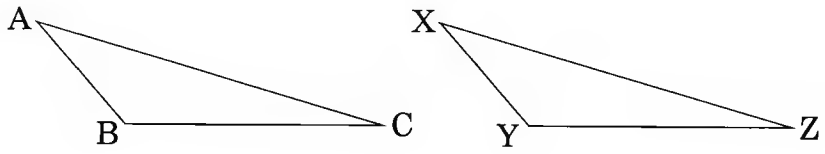
- Two parallel segments must both be named from either left to right or from right to left, and the letters used in both names must be in either ascending or descending alphabetical order. For example, assume the two segments in the following diagram are parallel:



Either of the following two statements is acceptable:

SEG AF PAR SEG CD
SEG FA PAR SEG DC

- When entering a statement about congruent triangles as a to-prove statement or a given statement, the corresponding points must be named in the same order. For example, let's assume that triangle ABC below is congruent to triangle XYZ:



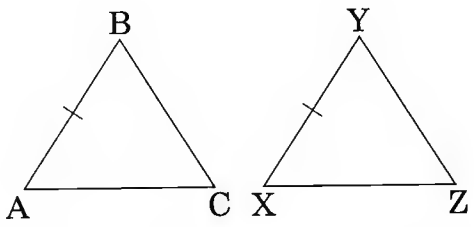
In Euclid Geometry Tutor, you can formulate the statement in six different ways:

TRI ABC CON TRI XYZ
TRI ACB CON TRI XZY
TRI BAC CON TRI YXZ
TRI BCA CON TRI YZX
TRI CAB CON TRI ZXY
TRI CBA CON TRI ZYX

If you use one of the above statements in your proof, then the program assumes that segment AB corresponds to segment XY, angle ABC to angle XYZ, segment BC to segment YZ, angle BCA to angle YZX, and so on.

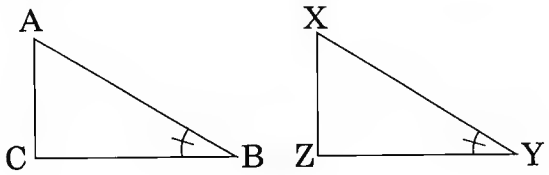
Note: The program may sometimes rearrange the order of letters in your triangle and line segment names. This is to aid the computer in its calculations, and does not affect the working of the program.

In all other cases, order is not important in naming components of geometric figures. For example, the congruency of two non-parallel segments can be expressed in four different ways:



SEG AB CON SEG XY
SEG AB CON SEG YX
SEG BA CON SEG XY
SEG BA CON SEG YX

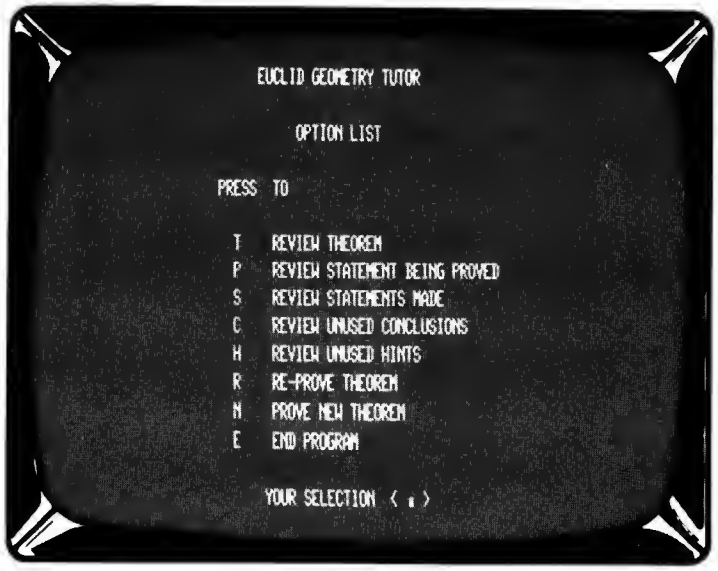
The congruency of two angles can be expressed in any one of the following ways:



ANG ABC CON ANG XYZ
ANG ABC CON ANG ZYX
ANG CBA CON ANG XYZ
ANG CBA CON ANG ZYX

COMMAND OPTIONS

Whenever you are constructing a proof and the cursor is blinking in the Statements column, you can look at the option list of commands by pressing [O] [ENTER]:



You can now type the letter of the desired option (remember to press [ENTER]). Once you have familiarized yourself with the options and their code letters, you can omit the option list display and simply press the letter key for the desired option. Any time the cursor is blinking in the Statements column, you can select:

T to clear the screen and print the theorem you are working on. (Also available from the Reasons column)

P to print the statement being proved. (Also available from the Reasons column)

S to print the statements and reasons entered so far. (Also available from the Reasons column)

C to print the remaining conclusions. (In the Practice mode, a conclusion which is identical to the statement being proved is marked with an arrow.)

H to print available hints.

R to return to the option list screen. If you press [R] again, you can return to the mode selection screen, allowing you to re-prove the theorem in a different mode.

N to return to the option list screen. If you press [N] again, you can return to the beginning of the program and type in new "to-prove" and "given" statements.

E to return to the option list screen. If you press [E] again, you can end the program.

Notice that if you use the R, N, or E option the program will first return to the option list screen. Since these three options cause the loss of part or all of the information you have entered so far, you are required as a safeguard to reconfirm your decision by entering the desired option letter again. If one of these options is entered *accidentally*, you can type [T] on the option list screen to display your theorem once more, then type [S] to re-display your statements and reasons, and continue your proof. At the end of a proof the three options R, N, and E are the only ones available.

Note: In this program a *hint* may be used as a statement if it can be justified with a reason at that point in the proof. When used in this way, the hint combines with previous statements to result in a conclusion that certain triangles in your proof are congruent. *Conclusions* generated by the program are always justifiable using preceding statements. Not all conclusions, however, are necessary steps in the proof. (No error message appears for an unnecessary step as long as it is properly justified with a reason; the proof is merely not as efficient as it could be.)

OPERATING MODES

In the Euclid Geometry Tutor program, the student can prove a theorem in any one of four modes corresponding to four levels of difficulty. The amount of assistance from the computer ranges from the maximum in Automatic mode (where the program develops the entire proof) to the minimum in Test mode (where the student enters all statements and reasons). The chart below specifies the features and available options for each of the four operating modes.

	AUTOMATIC	PRACTICE	QUIZ	TEST
STATEMENTS	Supplied by program	Supplied by student	Supplied by student	Supplied by student
REASONS	Supplied by program	Supplied by program	Supplied by student	Supplied by student
CONCLU-SIONS	Does not apply	Automatically printed on screen	Available through [C] Option	Not available
HINTS	Does not apply	Available through [H] Option	Available through [H] Option	Not available

ERROR MESSAGES

As you work with the Euclid Geometry Tutor program, an error message will be displayed if you type and enter a statement that:

- has a typographical error
- is not logically deducible from statements already accepted
- is otherwise not an allowable command or statement.

The following table lists the error messages, together with their meanings and the appropriate responses:

ERROR MESSAGE	MEANING	RESPONSE
DOES NOT QUALIFY AS A STATEMENT	The statement entered does not follow the guidelines for formulating statements.	Check spelling and spacing; retype statement. (See **CORRECTING TYPOGRAPHICAL ERRORS** on page 32 and **HOW TO FORMULATE STATEMENTS** on page 23.)
INVALID STATEMENT	The statement entered can not follow logically from previously-entered statements.	Be sure all givens have been used; examine logical strategy; add intermediate statements or revise approach.
INVALID USER COMMAND	The command entered is not on the list of available commands.	Enter [O] to review allowable options; re-enter command.
ONLY *n* GIVENS WERE INPUT	A given number (i.e., G3, G4, etc.) was selected for which no statement was entered at the beginning of the proof.	Select the [T] option to review the list of givens, and the [S] option to see which givens have already been used as statements.
ONLY *n* CONCLUSIONS REMAIN OF THE *m* FOUND	A conclusion number (i.e., C1, C2, etc.) was selected for which a conclusion has not been generated.	Use the [C] option to see available conclusions.

ERROR MESSAGE	MEANING	RESPONSE
REDUNDANT, SEE STA *n*	A statement was entered which duplicates a previous statement.	Use the [S] option to see what statements have already been used; continue proof; avoid entering equivalent or identical statements.
CONCLUSIONS NOT AVAILABLE IN TEST MODE	The [C] option was requested in the Test mode, where it is not available.	Continue proof; request only available options.
HINTS NOT AVAILABLE IN TEST MODE	The [H] option was requested in the Test mode, where it is not available.	Continue proof; request only available options.
EUCLID HAS FAILED	Occurs in the Automatic mode when insufficient information is supplied as givens, when the theorem is not true, or when the proof of the theorem relies on axioms or postulates not available to the Euclid Geometry Tutor program.	The program automatically changes to Practice mode. If the theorem is true, enter remaining statements in Practice mode.

Correcting Typographical Errors

To correct a typing error, backspace to the error using the left-arrow [←] key, then retype to the end of the line. If you wish to erase an entire line of text, press [SHIFT] [←] and the cursor returns to the beginning of the line.

SELECTED EXERCISES

The SELECTED EXERCISES section contains problems for use with the Euclid Geometry Tutor. It is divided into two sections:

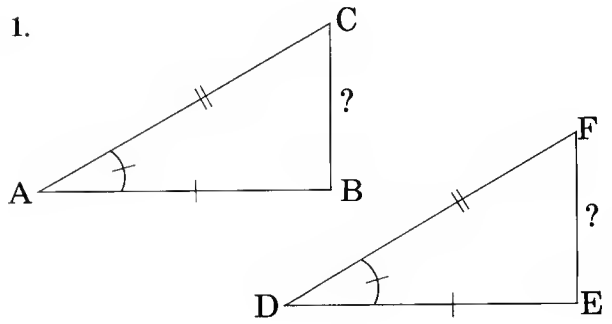
- Practice Problems
- Major Theorems.

The Practice Problems are presented in two ways: as fully-labelled diagrams with to-prove and given statements provided, and as unlabelled diagrams with congruent parts marked. The Major Theorems section contains word problems together with suggested approaches to their solutions.

PRACTICE PROBLEMS

Congruent parts are indicated by slashes; "to-prove" parts are indicated by question marks; parallel lines are indicated by arrows. (When labelling diagrams containing parallel lines, be sure to follow the naming rule described in **EQUIVALENT STATEMENTS** on page 26.)

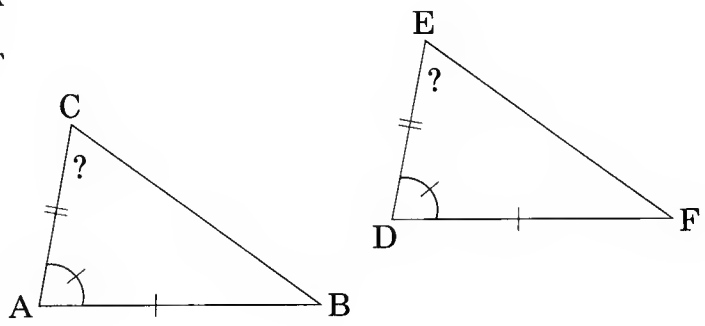
1.



Prove: SEG CB CON SEG FE
Given: SEG AB CON SEG ED
SEG AC CON SEG DF
ANG CAB CON ANG EDF

2.

Prove: ANG DEF CON ANG BCA
Given: SEG AC CON SEG DE
ANG CAB CON ANG EDF
SEG AB CON SEG FD



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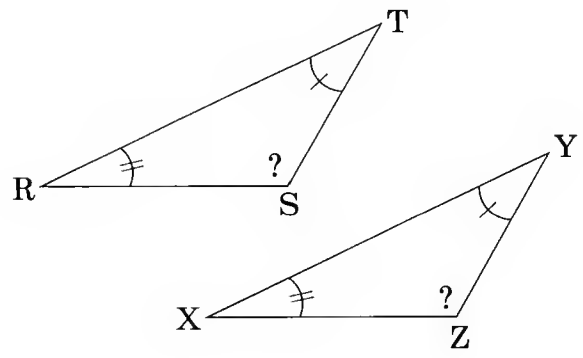
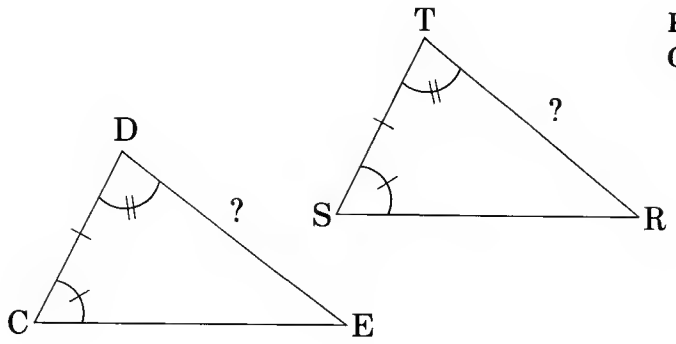


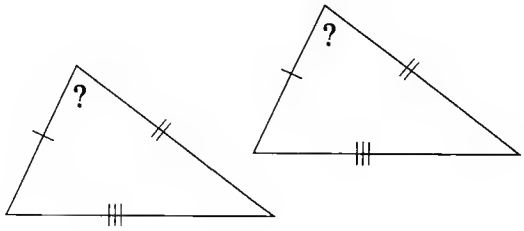
Prove: ANG RST CON ANG XZY
Given: ANG TRS CON ANG ZXY
ANG XYZ CON ANG STR

4.



Prove: SEG DE CON SEG RT
Given: ANG DCE CON ANG TSR
ANG RTS CON ANG EDC
SEG CD CON SEG TS

5.



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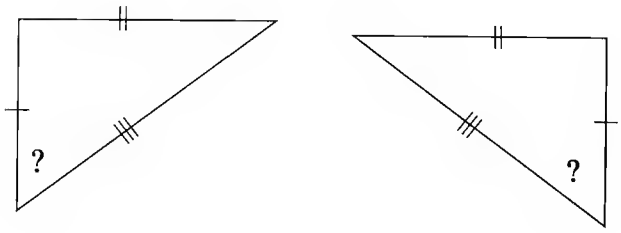

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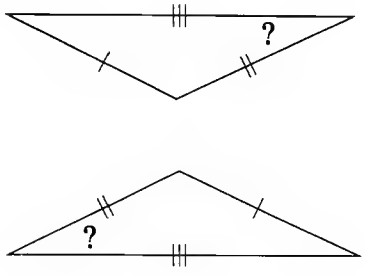
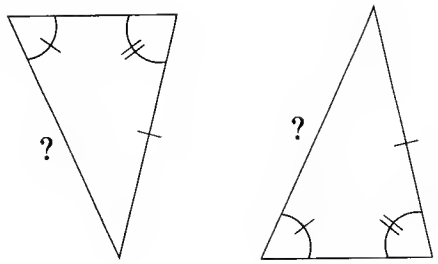
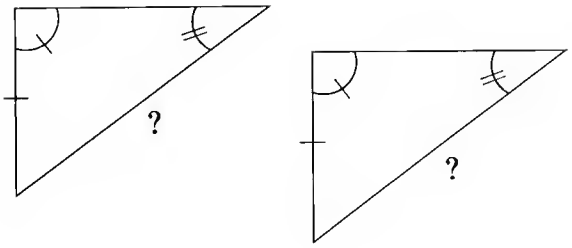


8.



9.



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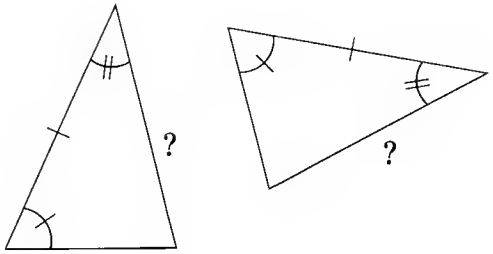

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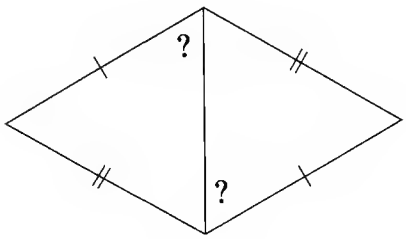

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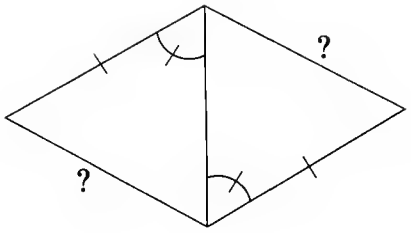

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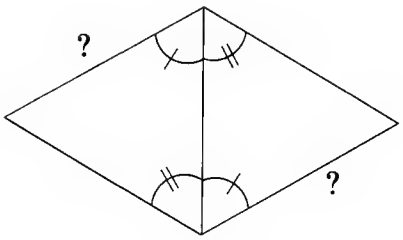

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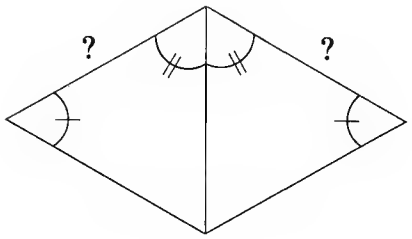
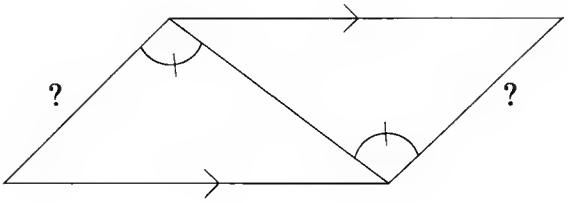
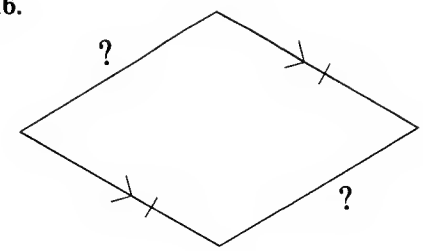


15.



16.



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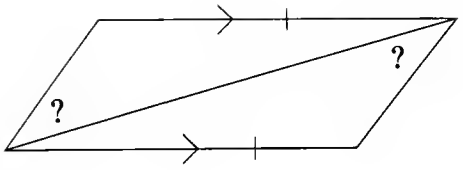

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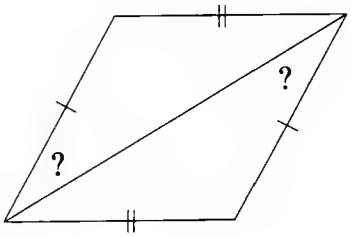

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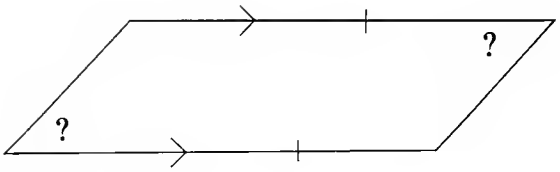

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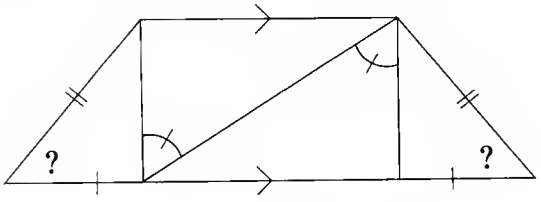

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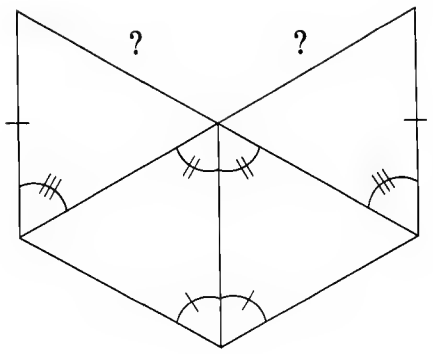

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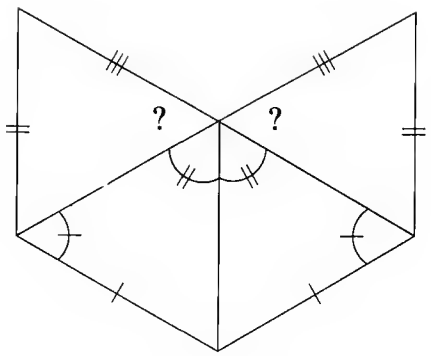
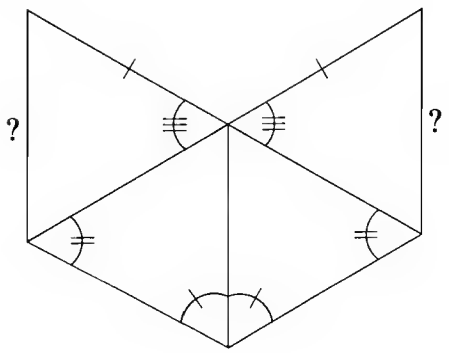
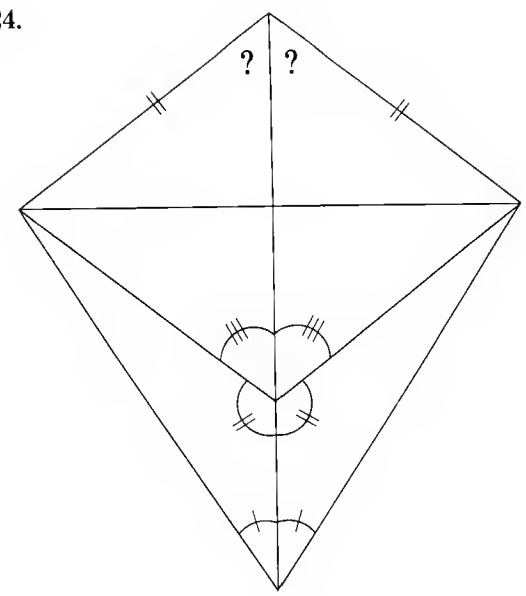


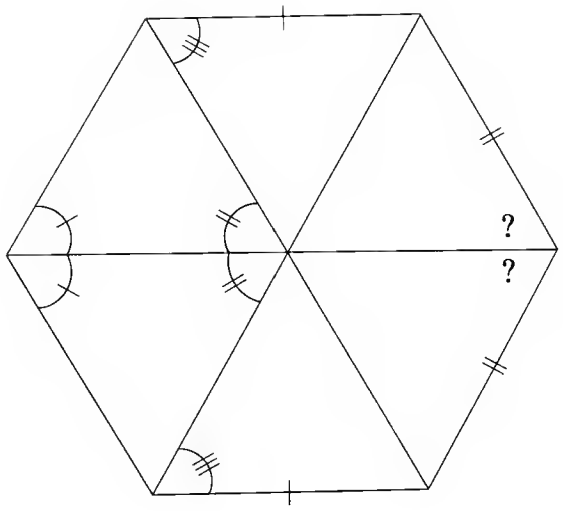
23.



24.

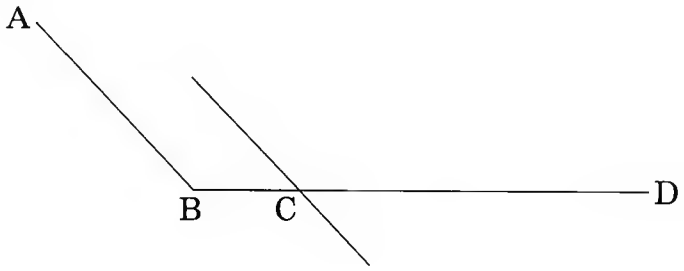


25.



MAJOR THEOREMS

Whenever you want to prove a theorem relying on the existence of three collinear points (as in several of the theorems in this section) you must make a special provision in the form of an extra given statement. For example, in the following diagram the program will *not* automatically conclude that angles ABC and ABD represent the same angle because points B, C, and D are collinear.



You *must* include the statement

ANG ABC CON ANG ABD

as a given if this assertion is necessary to a proof.

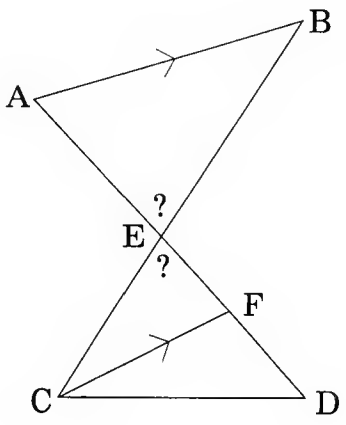
You can use Euclid Geometry Tutor to prove any of the following theorems:

1. **THEOREM**

   Vertical angles are congruent.

   SUGGESTED APPROACH

   Let line segments AD and BC intersect at point E. (In general, CD is not parallel to AB.) Produce line segment CF parallel to AB with point F lying on line AD.

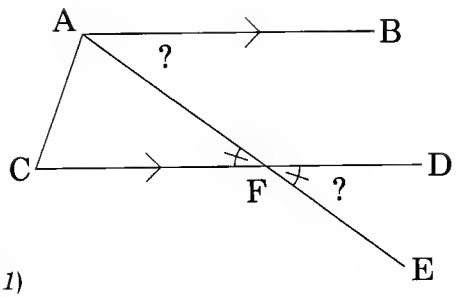


   Prove: ANG AEB CON ANG CED
   Given: SEG AB PAR SEG CF
   ANG CEF CON ANG CED
   ANG ABC CON ANG ABE
   ANG BAF CON ANG BAE
   ANG BCF CON ANG ECF
   ANG AFC CON ANG EFC

2. **THEOREM**

If two parallel lines are intersected by a transversal, then corresponding angles are congruent.

SUGGESTED APPROACH



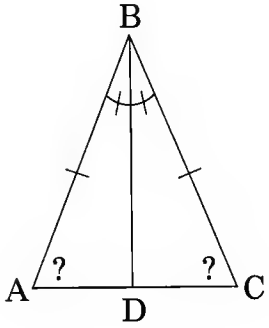
Let line segment AE intersect parallel line segments AB and CD at points A and F respectively.

Prove: ANG BAE CON ANG DFE
Given: SEG AB PAR SEG CF
ANG AFC CON ANG DFE (*by Theorem 1*)
ANG BAF CON ANG BAE

3. **THEOREM**

If two sides of a triangle are congruent, then the angles opposite these sides are congruent.

SUGGESTED APPROACH



Let triangle ABC have two congruent sides, AB and BC, with segment BD bisecting angle ABC.

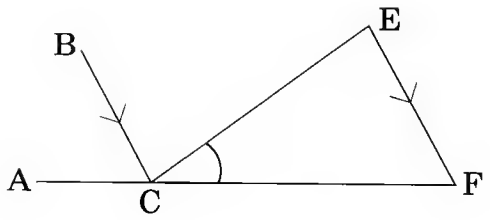
Prove: ANG BAC CON ANG BCA
Given: SEG AB CON SEG BC
ANG ABD CON ANG CBD
ANG BAD CON ANG BAC
ANG BCD CON ANG BCA

4. **THEOREM**

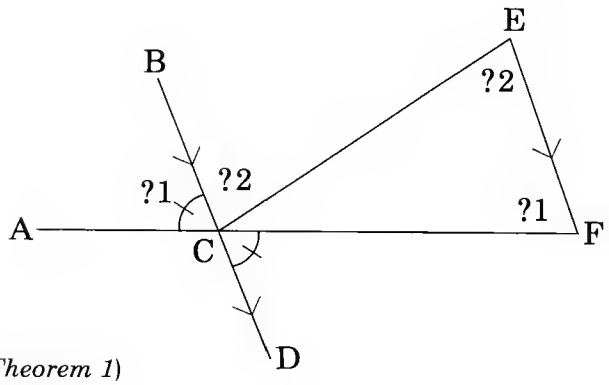
The measure of an exterior angle of a triangle is the sum of the measures of its opposite interior angles.

SUGGESTED APPROACH

Produce BC parallel to EF and intersecting segment AF at point C. Since the exterior angle of angle ECF is angle ACE which is equal in measure to the sum of the measures of angles ACB and BCE, it suffices to show that angle ACB is congruent to angle CFE and angle BCE is congruent to angle CEF. These angles are congruent by Theorem 2 and the PAI postulate, respectively.



To prove the theorem without using Theorem 2, let line segment AF intersect parallel line segments BD and EF at points C and F, respectively. As before, it suffices to show that angle ACB is congruent to angle CFE and angle BCE is congruent to angle CEF.



Prove: ANG ACB CON ANG CFE
Given: SEG BC PAR SEG EF
SEG CD PAR SEG EF
ANG FCD CON ANG ACB (*by Theorem 1*)

(The congruence of the other two angles is proved in the process of the above proof in Automatic mode.)

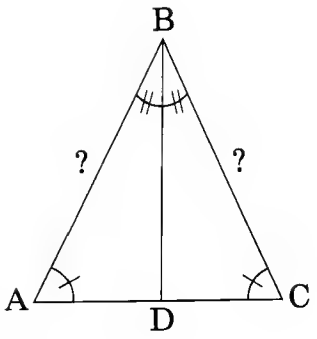
5. **THEOREM**

If two angles of a triangle are congruent, then the sides opposite these angles are congruent.

SUGGESTED APPROACH

Let triangle ABC have two congruent angles, CAB and ACB, with segment BD bisecting angle ABC and joining side AC at point D.

Prove: SEG AB CON SEG BC
Given: ANG CAB CON ANG ACB
ANG ABD CON ANG CBD
ANG BAD CON ANG BAC
ANG BCD CON ANG BCA



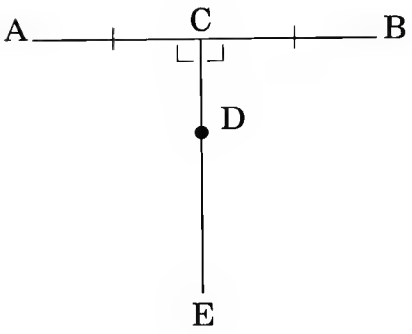
6. **THEOREM**

A point on the perpendicular bisector of a segment is equidistant from the endpoints of the segment.

SUGGESTED APPROACH

Let CE be the perpendicular bisector of segment AB with C lying on AB and D being the point of interest on CE.

Prove: SEG AD CON SEG BD
Given: ANG ACE CON ANG BCE
SEG AC CON SEG BC
ANG ACD CON ANG ACE
ANG BCD CON ANG BCE

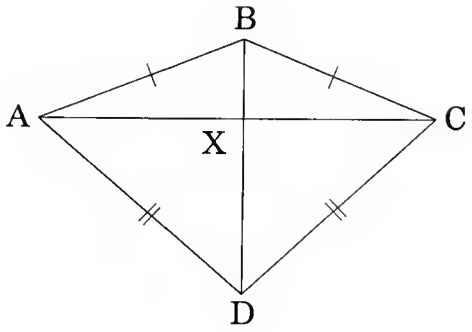


7. **THEOREM**

Two points each equidistant from the endpoints of a segment determine the perpendicular bisector of the segment. (The perpendicular aspect cannot be proved directly by the program and is included in the theorem statement only for completeness.)

SUGGESTED APPROACH

Let points B and D each be equidistant from the endpoints of segment AC, with the line connecting B and D intersecting segment AC at point X.



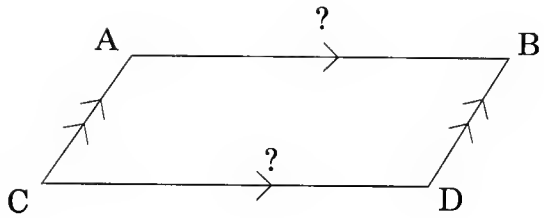
Prove: SEG AX CON SEG CX
Given: SEG AD CON SEG CD
SEG AB CON SEG CB
ANG ADB CON ANG ADX
ANG CDB CON ANG CDX

8. **THEOREM**

Opposite sides of a parallelogram are congruent.

SUGGESTED APPROACH

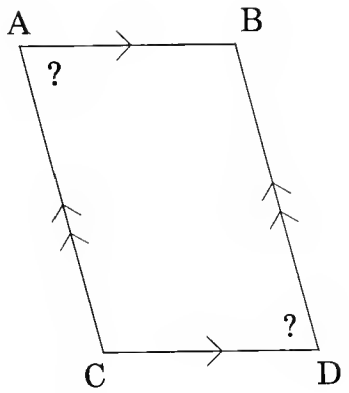
Let parallelogram ABDC have side AB parallel to CD and CA parallel to DB. It suffices to show that AB is congruent to CD since the proof for congruence of the other two sides is similar.



Prove: SEG AB CON SEG CD
Given: SEG AB PAR SEG CD
SEG CA PAR SEG DB

9. **THEOREM**

Opposite angles of a parallelogram are congruent.



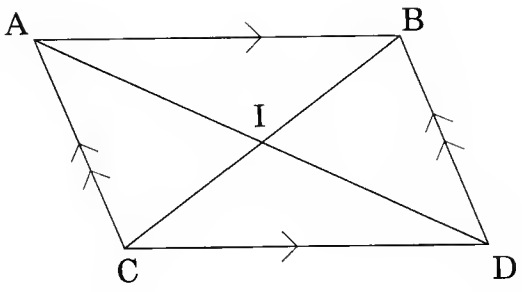
SUGGESTED APPROACH

Let parallelogram ABDC have side AB parallel to CD and CA parallel to DB. It suffices to show that angle CAB is congruent to angle BDC since the proof for congruence of the other two angles is similar.

Prove: ANG CAB CON ANG BDC
Given: SEG AB PAR SEG CD
SEG CA PAR SEG DB

10. **THEOREM**

The diagonals of a parallelogram bisect each other.



SUGGESTED APPROACH

Let diagonals AD and BC of parallelogram ABDC intersect at point I. It suffices to show that segment IB is congruent to segment IC since the proof for bisection of the other diagonal is similar.

Prove: SEG IB CON SEG IC
Given: SEG AB PAR SEG CD
SEG AC PAR SEG BD
ANG ABI CON ANG ABC
ANG BAI CON ANG BAD
ANG BCD CON ANG ICD
ANG ADC CON ANG IDC

APPENDIX I

MAKING A BACKUP COPY OF THE EUCLID GEOMETRY TUTOR PROGRAM

Using the Computer Tape System

It is good practice to make a backup copy of the Euclid Geometry Tutor program cassette to use with your students. The original cassette supplied with the program should be stored to protect it from damage. To make a backup copy, follow the steps below.

I. GETTING READY

A. If the computer is off:

1. Follow Step 1 on page 7 of this manual.

2. Skip to II.

B. If the computer is on and Euclid Geometry Tutor is loaded:

1. If Euclid Geometry Tutor is running, use the termination code [E] and wait for the **READY** prompt.

2. When the **READY** prompt is showing, skip to III.

C. If the computer is on and a program other than Euclid Geometry Tutor is loaded:

1. If the program is running, terminate the program by using the [BREAK] key or any special code that may apply to that particular program.

2. When the **READY** prompt appears, type [N] [E] [W] [ENTER].

3. When the **READY** prompt appears again, you are ready to load Euclid Geometry Tutor.

II. LOADING EUCLID GEOMETRY TUTOR

Follow Steps 2 through 8 on page 7 of this manual.

III. MAKING A NEW COPY OF THE PROGRAM TAPE

A. Place a blank cassette in the recorder. (Use only TRS-80 C-20 certified cassettes, or other digital quality cassettes.)

B. Make sure the tape is rewound. Use the "FAST FORWARD" button if necessary to advance the tape past the leader.

C. Press "PLAY" and "RECORD" simultaneously.

D. Type [C][S][A][V][E]["][G]["] and press [ENTER].

E. Wait for the **READY** prompt to reappear. (The recorder will start to run and will stop automatically when the prompt appears.)

F. Rewind the cassette.

G. Remove and label the cassette which now contains a new copy of Euclid Geometry Tutor.

Using the Computer Disk System

It is good practice to make a backup copy of the Euclid Geometry Tutor program diskette to use with your students. The original diskette supplied with the program should be stored to protect it from damage. To make a backup copy, follow the steps below.

I. **Model I Two-Drive System**

1. Turn on everything except the TRS-80 keyboard. If this is the first time you've ever used the Radio Shack Disk System, refer to the *Disk Operating System/Disk Basic* manual for detailed instructions.

2. Insert a new, blank diskette in DRIVE 1 (second from the expansion interface on the cable) with the square notch up and the label to the right, and close the door.

3. Place an adhesive tab (provided with new diskettes) over the square notch in the program diskette. If you do not have any tabs, use a small piece of cellophane tap

4. Insert the program diskette in DRIVE 0 (closest to expansion interface on the cable) with the covered notch up and the label to the right, and close the door.

5. Turn on the TRS-80 keyboard. (The On/Off button is on the right rear of the keyboard.)

6. When the screen shows: — You type:

   DOS READY — [B] [A] [C] [K] [U] [P] [ENTER]

   SOURCE DRIVE NUMBER? — [0] [ENTER]

   DESTINATION DRIVE NUMBER? — [1] [ENTER]

   BACKUP DATE (MM/DD/YY)? — [0] [2] [/] [0] [1] [/] [8] [1] [ENTER]
   (Example for February 1, 1981)

   The drives will come on and the computer will proceed to make the backup. If, after the drives stop spinning, the screen shows:

   BACKUP COMPLETE
   HIT <ENTER> TO CONTINUE

   then press [ENTER].

   If, after the drives stop spinning, the screen shows an error message of any kind, or does not say **BACKUP COMPLETE**, then press the RESET button and go back to Step 6. If an error still occurs, then get a new blank diskette or bulk erase the diskette you have been using as destination disk. Then insert the blank diskette in DRIVE 1, press [ENTER], and go to Step 6.

II. Model I One-Drive System

1. Turn on everything except the TRS-80 keyboard. If this is the first time you've ever used the Radio Shack Disk System, refer to the *Disk Operating System/Disk Basic* manual for detailed instructions.

2. Place an adhesive tab (provided with new diskettes) over the square notch in the program diskette. If you do not have any tabs, use a small piece of cellophane tape.

3. Insert the program diskette in the disk drive with the covered notch up and the label to the right. Close the door.

4. Turn on the TRS-80 keyboard. (The On/Off button is on the right rear of the keyboard.)

5. When the screen shows: — You type:

DOS READY	[B][A][C][K][U][P] [ENTER]
SOURCE DRIVE NUMBER?	[0] [ENTER]
DESTINATION DRIVE NUMBER?	[0] [ENTER]
BACKUP DATE?	[0][2][/][0][1][/][8][1] [ENTER] (Example for February 1, 1981)
INSERT SOURCE DISK	Press [ENTER]
INSERT DESTINATION DISK	After the red light on the disk drive goes off, remove the program diskette and insert a new, blank diskette with the uncovered square notch up and the label to the right. Close the door and press [ENTER].
INSERT SOURCE DISK	Continue to switch back and forth between the program diskette (**SOURCE DISK**, notch covered) and the new diskette (**DESTINATION DISK**, notch uncovered) as instructed on the screen. Do not open the disk drive door while the red light is on.

If the screen shows:

BACKUP COMPLETE
HIT <ENTER> TO CONTINUE

then press [ENTER].

If the screen shows an error message of any kind, or does not say **BACKUP COMPLETE**, then put the program diskette back in the drive, press the RESET button and go back to Step 5. If an error still occurs, get a new blank diskette or bulk erase the diskette you have been using as destination disk. Put the program diskette back in the drive, press [ENTER], and go to Step 5.

III. Model III Two-Drive System

1. Turn on the computer. (The On/Off switch is under the right side of the keyboard.)

2. Insert a new, blank diskette in DRIVE 1 (the top disk drive) with the square notch to the left and the label facing up, and close the door.

3. Place an adhesive tab (provided with new diskettes) over the square notch in the program diskette. If you do not have any tabs, use a small piece of cellophane tape.

4. Insert the program diskette in DRIVE 0 (the bottom drive) with the covered notch to the left and the label facing up, and close the door.

5. Press the orange RESET button.

6. When the screen shows: — You type:

Enter Date (MM/DD/YY)?	[0][2][/][0][1][/][8][1] [ENTER] (Example for February 1, 1981)
Enter Time (HH:MM:SS)?	Press [ENTER]
TRSDOS Ready	[B][A][C][K][U][P] [ENTER]
SOURCE Drive Number?	[0] [ENTER]
DESTINATION Drive Number?	[1] [ENTER]
SOURCE Disk Master Password?	[P][A][S][S][W][O][R][D] [ENTER]

The drives will come on and the computer will proceed to make the backup. If, after the drives stop spinning, the screen shows:

****Backup Complete****

then remove the original diskette from DRIVE 0 and store it in a safe place. You can now place your backup copy in DRIVE 0 and continue working with the program.

If, after the drives stop spinning, the screen shows an error message of any kind, or does not say **Backup Complete**, then press the orange RESET button and go back to Step 6. If an error still occurs, then get a new blank diskette or bulk erase the diskette you have been using as destination disk. Then insert the blank diskette in DRIVE 1, press the RESET button, and go to Step 6.

IV. Model III One-Drive System

1. Turn on the computer. (The On/Off switch is under the right side of the keyboard.)

2. Place an adhesive tab (provided with new diskettes) over the square notch in the program diskette. If you do not have any tabs, use a small piece of cellophane tape.

3. Insert the program diskette in the disk drive with the covered notch to the left and the label facing up. Close the door.

4. Press the orange RESET button.

5. When the screen shows: — You type:

   TRSDOS Ready — [B][A][C][K][U][P] [ENTER]

   SOURCE Drive Number? — [0] [ENTER]

   DESTINATION Drive Number? — [0] [ENTER]

   SOURCE Disk Master Password? — [P][A][S][S][W][O][R][D] [ENTER]

   Insert SOURCE Diskette <ENTER> — Press [ENTER]

   Insert DESTINATION Diskette <ENTER> — After the red light goes off, remove the program diskette and insert a new blank diskette with the uncovered notch to the left and the label facing up. Close the door and press [ENTER].

   Insert SOURCE Diskette <ENTER> — Continue to switch back and forth between the program diskette (**SOURCE diskette**, notch covered) and the new diskette (**DESTINATION diskette**, notch uncovered) as instructed on the screen. Do not open the disk drive door while the red light is on.

   If the screen shows:

   ****Backup Complete****
   Insert SYSTEM Diskette <ENTER>

   then press [ENTER].

   If the screen shows an error message of any kind, or does not say **Backup Complete**, then put the program diskette back in the drive, press the RESET button, and go back to Step 5. If an error still occurs, get a new blank diskette or bulk erase the diskette you have been using as destination diskette. Put the program diskette back in the drive, press the RESET button, and go to Step 5.

APPENDIX II

FOR TRS-80 MODEL III OWNERS

Conversion Procedure

I. Model III Two-Drive System

A. Turn on the computer.

B. When the red light goes off, insert the Model III TRSDOS diskette in DRIVE 0 (the bottom drive) and the Model I diskette in DRIVE 1 (the top drive) with the label facing up and the square notch to the left, and close the doors. Press the orange RESET button.

C. Type the date, being sure to use two digits each for the month, day, and year, with a slash separating each pair. Then press [ENTER].

D. Enter the time OR simply press [ENTER]. (If you enter the time, be sure to use two digits each for the hour, minutes, and seconds, with a colon separating each pair.)

E. When **TRSDOS Ready** appears on the screen, type [C][O][N][V][E][R][T] and press [ENTER].

F. When the question, **Source Drive?**, appears on the screen, type [1] and press [ENTER].

G. When the question, **Destination Drive?**, appears on the screen, type [0] and press [ENTER]. Note: If a filename on the Model I diskette is also on the Model III diskette, this message appears:

(FILENAME) Existing File. Use it (Y/N/Q)?

If you type [Y] for YES, the file is converted. If you type [N] for NO, the file is skipped, and the computer moves to the next one. If you type [Q] for QUIT, the computer returns to **TRSDOS Ready**.

When **TRSDOS Ready** appears, the conversion is complete.

II. Model III One-Drive System

A. Turn on the computer.

B. When the red light goes off, insert the Model III TRSDOS diskette in the drive with the label facing up and the square notch to the left, close the door, and press the orange RESET button.

C. Type in the date, being sure to use two digits each for the month, day, and year, with a slash separating each pair. Then press [ENTER].

D. Enter the time OR simply press [ENTER]. (If you enter the time, be sure to use two digits each for the hours, minutes, and seconds, with a colon separating each pair.)

E. When **TRSDOS Ready** appears, type [B][A][S][I][C] [ENTER].

F. Press [ENTER] after each of the questions, **How Many Files?** and **Memory Size?**

G. When the **READY** prompt appears, type [P][O][K][E][1][6][9][1][3][,][0] to change to low cassette speed (500 baud). (Be sure to proofread the line carefully before pressing [ENTER].)

Note: If you should enter a number other than 16913, press the RESET button and start again from Step C.

H. Follow Steps 2 through 8 on page 7 of this manual.

I. Type [S][A][V][E]["][G][E][O][M][E][T][R][Y]["] and press [ENTER].

CHANGING TO HIGH CASSETTE SPEED

If you want to return to the high cassette speed (1500 baud), follow these steps:

- When the **READY** prompt appears on the screen, type [P][O][K][E] [1][6][9][1][3][,][1]. Be sure to proofread the line carefully before you press [ENTER].

OR

- Press the RESET button. When **TRSDOS Ready** appears, type [B][A][S][I][C] and press [ENTER].
- Press [ENTER] after each of the questions, **How Many Files?** and **Memory Size?**

APPENDIX III

PLANNING YOUR APPLICATION

Appropriate Applications

There seems to be an endless variety of ways to use a computer with students. Some that are appropriate for use with the Radio Shack Euclid Geometry Tutor program are:

- A number of computers or "student stations" are placed in a special room or learning lab, where students attend scheduled sessions. A special teacher or teacher aide may be in charge of the lab to help students load and run specified programs, to record scores, and to help with operation of the system. This scheduled approach provides maximum computer utilization and makes possible the lowest obtainable cost per hour of usage.

- Individual computers are placed in regular classrooms, where they are available to the teacher for use with individual students at the teacher's discretion. This use is becoming more common with the new microcomputers due to the low cost for each system and due to the portability of these systems (no special telephone lines or modems are required).

- Individual computers are loaned or "checked out" to students to take home and use to solve special assignments, or as an incentive for individual studies.

- Computers are provided for general student use in a library—during school, or after hours—for periods of time that a student can reserve in advance.

- Computers are provided for use by teachers at a central service center or audio-visual library. A teacher can check out a system for use in his/her class. Again, the portability of the microcomputer and its freedom from telephone communication lines makes this use convenient.

There are numerous combinations of these and other uses that are possible. Your own unique circumstances — number of students, or number of computers available — will influence your plans. The following information is designed to help you in planning for the use of microcomputers in your school, and to give you the benefit of others' experience in developing a realistic and satisfactory installation in your own facility.

Saving and Loading Programs: Cassettes vs. Diskettes

The audio cassette is the least expensive method of saving and loading programs for a microcomputer. The basic version of almost all microcomputers includes a cassette recorder for this purpose. Due to its reasonable cost, the cassette recorder merits consideration for use as a program storage device in a classroom; it makes possible the lowest obtainable hardware cost per hour of student operation.

Under proper conditions, the cassette recorder can be a satisfactory storage medium for use with microcomputers. However, there are some special considerations that should be given before deciding on the cassette for program storage over another medium such as the

diskette. First, the quality of cassette tapes used for storage of computer programs (digital information) is more critical than for audio use. In addition, static electricity can damage information recorded on cassettes in a carpeted area, or in a dry climate. And, since a program stored on a cassette takes longer to load into a microcomputer than a similar program stored on a diskette, operational considerations may make the use of the cassette recorder for loading programs unrealistic in the classroom setting.

The Radio Shack Network 2 System

This system is a low-cost alternative to cassette tapes for saving and loading student programs for the classroom. The Radio Shack Network Controller allows from one to sixteen TRS-80's to be connected to one TRS-80 disk system using the cassette ports. By using the central disk system, student programs can be saved on disk, and instructional programs can be loaded into the TRS-80 student stations from the central disk system conveniently and reliably. All sixteen student stations can be loaded simultaneously, or any combination of stations can be loaded at a time.

A Second Alternative: An Expansion Interface and Disk Drive for Each Student Station

Although this increases the cost per student station, this is still considerably less expensive than a conventional timesharing system, and there are several advantages over a cassette. First, several programs can be stored on a single diskette and loaded into the computer conveniently by merely typing the program name to be loaded. In addition, no rewinding or tape positioning using an index counter is required with the diskette. And, most important, programs can be loaded from a diskette many times faster than from tape, making the diskette much more desirable from an operational standpoint. A program that requires a couple of minutes to load from a cassette can be loaded in a few seconds from a diskette. Finally, remember that a method of loading programs is important when the TRS-80 is used as a medium for instruction with programs such as the Radio Shack Euclid Geometry Tutor. However, where the TRS-80 is used as an object of instruction for teaching about the computer, the ability to load and save programs may not be as important. *Introduction to BASIC*, the first part of the Radio Shack Computer Education Series, does not require that any prepared programs be loaded for instruction or demonstration. All program examples are brief and designed to be entered by the student using the keyboard. (One section of this course does teach the proper use of the recorder for saving and loading programs.)

Choosing a Location: Environmental Considerations

Large computer systems require temperature- and humidity-controlled environments with air filtration systems to eliminate dust and other contaminants. Fortunately, the TRS-80 is not so demanding.

At the same time, certain considerations in the location you choose for your microcomputer will have a direct effect upon its operation and reliability. For best results, you should keep these in mind when choosing the location.

Static Electricity

In dry climates and certain seasons, you can walk across a carpet and feel the static discharge when you touch a metal object. Under some climatic conditions, even your clothing can build up this kind of charge that is normally too small for you to feel. These static charges can damage magnetically-stored computer data. Larger charges can even wipe out your computer's memory or cause it to appear to "lock up." If you are in a part of the country where humidity is lower than about 40%, be wary! The ideal humidity level for the operation of a computer is 50% or above. The safest bet is to use a non-carpeted room for your computer, and if you find a really stubborn problem, a humidifier should do the trick. An anti-static floor mat at the computer operator's position can also help.

This is a rather infrequent problem in actual practice, so rest assured we are not trying to imply that you will have this or any of the other problems we have mentioned. We are simply explaining why choice of your installation location should be given consideration and what to do just in case you do encounter a problem.

Power Line Interference

Any complex electronic equipment is sensitive to power line conditions affecting the voltage and current coming out of your wall socket. Computers are probably more sensitive than other electronics because the loss of even one bit (one tiny electrical charge) of information can cause a problem to "bomb out" or a data file to be lost. This is rarely a problem unless you are operating in an environment where heavy electrical machinery is in operation. Yet you might experience trouble if an appliance or office machine has a defective switch which arcs when turned on or off. If this happens, you will have to (1) repair the appliance, or isolate the power going to the computer by either (2) installing a separate line or (3) using a line filter. (Radio Shack sells a low-cost line filter that will cure the problem in 90% of these cases.) In a severe case, both (2) and (3) may be required. "Brownouts" (periodic drops in line voltage to unusually low levels) or power line "spikes" (transient surges of very large voltage levels lasting only a fraction of a second) may require the addition to your system of a "constant voltage transformer."

Power line problems are rare and many times can be solved before they occur by proper choice of installation location for your computer system. The more complex the system, the more consideration you should give to your installation.

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NOTE: Good data processing procedure dictates that the user test the program, run and test sample sets of data, and run the system in parallel with the system previously in use for a period of time adequate to insure that results of operation of the computer or program are satisfactory.

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